(12) UK Patent Application (19) GB (11) 2 207 726 (13) A

(43) Application published 8 Feb 1989

(21) Application No 8817707

(22) Date of filing 25 Jul 1988

(30) Priority data
(31) 8717671 (32) 25 Jul 1987 (33) GB

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(51) INT CL⁴
F16B 13/14

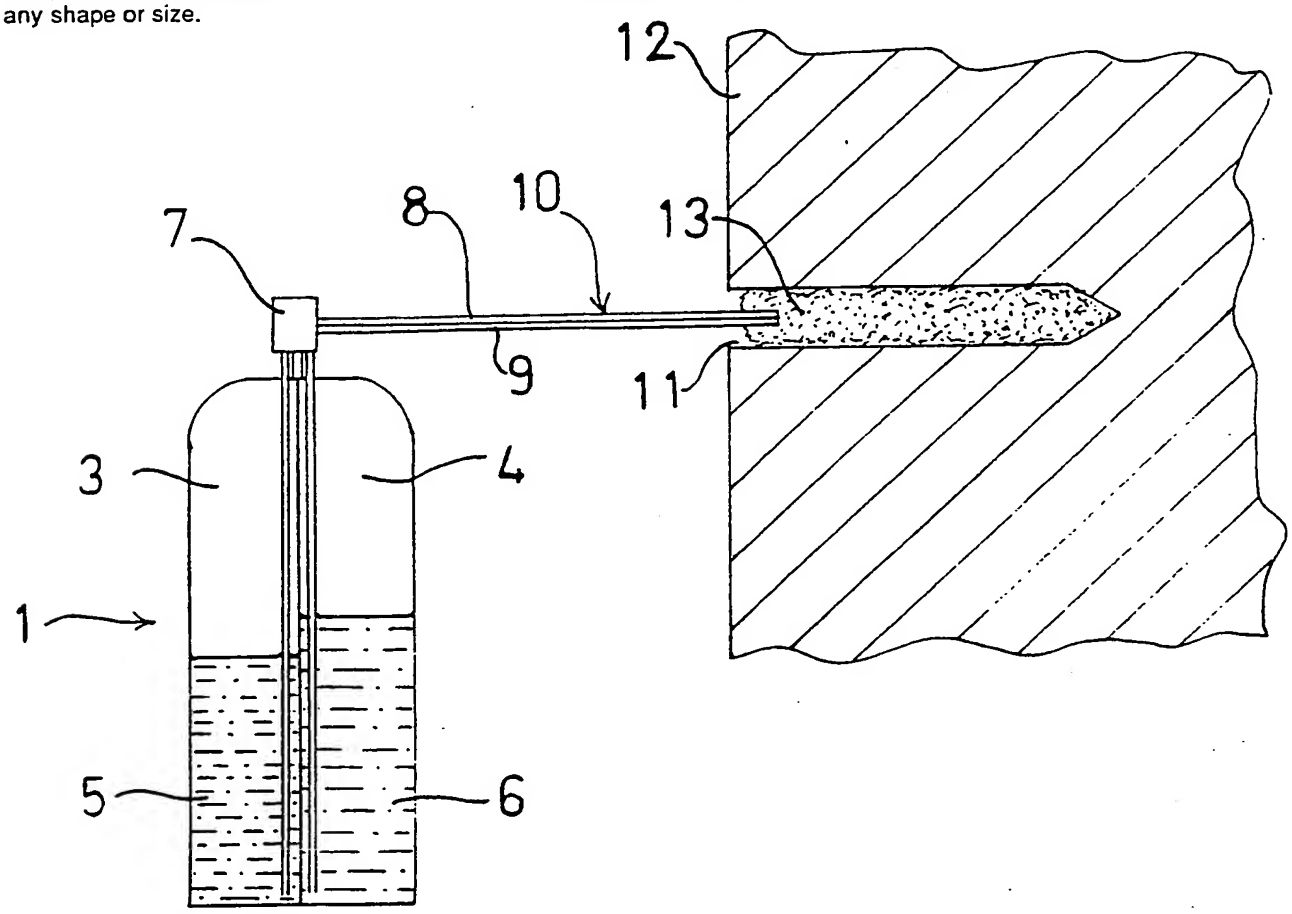
(52) Domestic classification (Edition J):
F2H AV

(56) Documents cited
GB A 2124918 GB A 2097887 GB A 2024978
GB 1587469 GB 1570111 GB 1448753
GB 0888076 GB 0500109 GB 0470761

(58) Field of search
F2H
Selected US specifications from IPC sub-class
F16B

(54) Wall plugs

(57) A method of forming a wall plug in a hole 11 provided in a wall 12, involves ejecting a plastics material 13 from a discharge nozzle 10 into the hole 11, which plastics material foams in order to fill the hole 11. The plastics material 13 cures to form a composition into which, for example, a wood screw may be securely held. The plastics material may be made up from two components 5, 6 held in respective compartments 3, 4 of a container 1. The components 5, 6 are delivered to the hole by means of separate pipe portions 8, 9. Upon ejection from the pipe portions 8, 9, the respective components 5, 6 are allowed to mix. The method may provide a simple and efficient way of securing a wall plug in holes of any shape or size.



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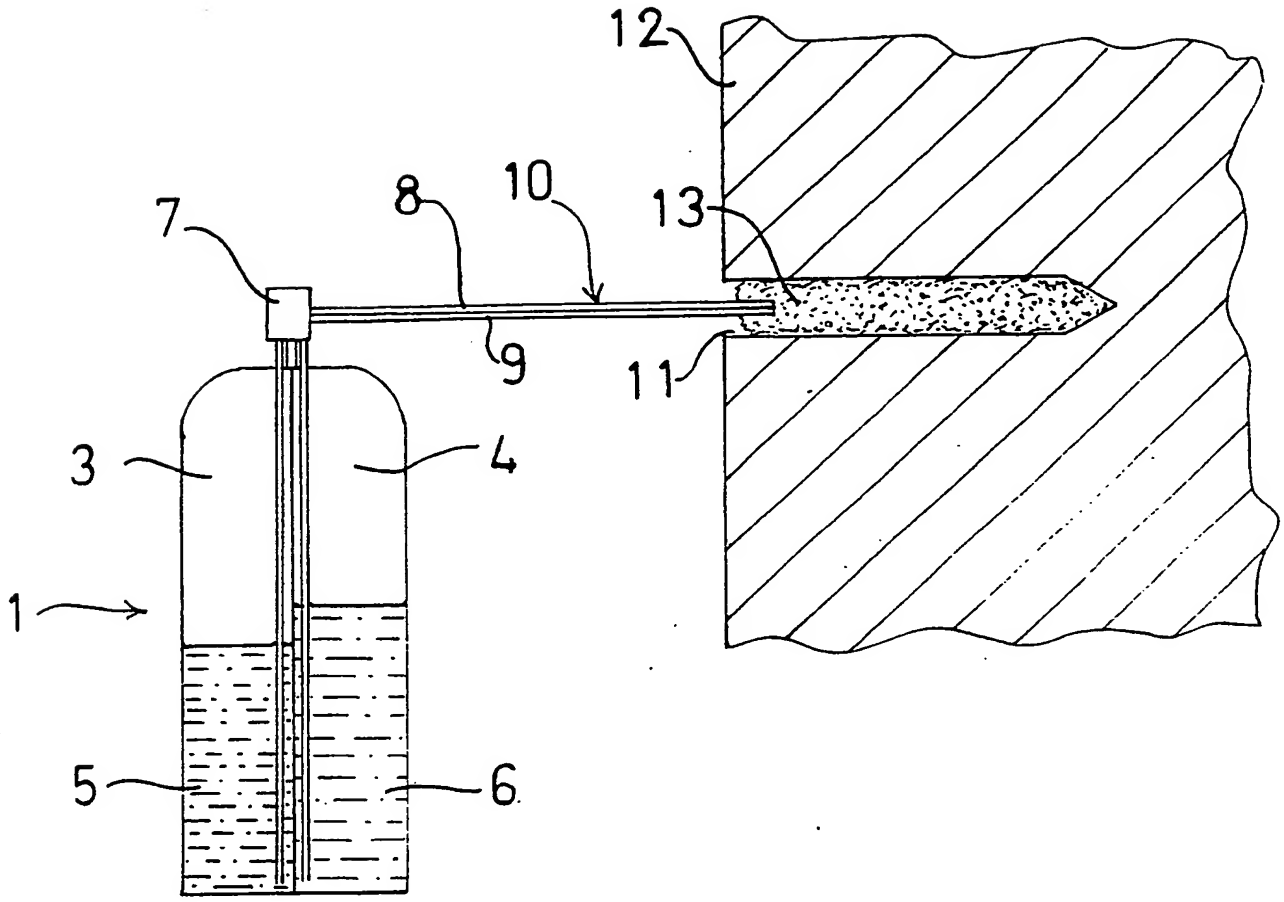

WALL PLUGS

This invention relates to wall plugs.

Wall plugs have been used for very many years - typically, for fixing such things as screws and nails into masonry. To provide a sound fixing, a wall plug must fit snugly into the hole that is provided for it. For many years, wall plugs were hand fashioned out of wood, and force fitted into holes to accommodate them. This generally required a good deal of skill, and often required the receiving hole to be fairly large.

To simplify matters, preformed wall plugs were manufactured - firstly, out of fibrous materials, and subsequently, out of plastics materials. The user then simply had to drill a hole of an appropriate size, press the wall plug into the hole, and then insert the screw or other fixing device into a central bore of the wall plug.

However, even such simplified wall plugs can have disadvantages. For example, if the receiving wall is rather old and/or crumbly, the pre-drilled hole may end up rather larger than one had intended. Also, the pre-formed fibrous or plastics wall plugs are of little use in providing anchorages into holes of irregular shapes. Moreover, stocks of different size wall plugs have to be kept, for fixings of different sizes.

The present invention aims to provide more versatile wall plugs.

According to one aspect of the present invention, there is provided a method of forming a wall plug, comprising the step of applying a foamed plastics

material in a hole, and allowing the foamed plastics material to set to form a wall plug in situ in the hole.

The foamed plastics material may be applied through a nozzle which is inserted into the hole. Alternatively, the foamed plastics material may be applied through a nozzle which is directed towards the hole, the foamed plastics material being applied into the hole from the outside thereof. The foamed plastics material may be spray applied or applied in the form of a viscous liquid.

The method may include the additional step of forming a hole for containing the wall plug.

According to another aspect of the invention, there is provided apparatus for forming a wall plug in situ in a hole, the apparatus comprising a container; a liquid plastics material within the container; means for ejecting the plastics material from the container; and nozzle means for applying the ejected plastics material into a hole; the plastics material being such as to foam upon application through said nozzle, and to cure to a relatively hard state after such application.

In the context of the specification the word "plastics" includes a composition which exists as such, or any one of two or more components which may be mixed to form a plastics composition.

The plastics material within the container may be a single composition which foams on contact with air. Alternatively, the plastics material may comprise two or more parts which are held separately within the container and are mixed together before, during or after the

application. The two or more separate parts, upon mixing, may react together to produce gaseous product. The gaseous product may aid curing of the plastics material.

The liquid plastics material may be chosen from a group comprising di-isocyanates, amino-formaldehyde resins, or phenyl-formaldehyde resins. Alternatively the liquid plastics material may be either an epoxy compound, a two component polyurethene, or a peroxide cured unsaturated polyester resin.

A propellant may be included in said container. A blowing agent may also be included in said container. The plastics material may be pressurised in order to aids its ejection from the container.

The container may include a surfactant, a colouring agent and/or a compound which stabilises the plastics material.

The nozzle may have non-stick properties relative to the plastics material.

For a better understanding of the invention and to show how the same may be carried into effect, reference will now be made, by way of example, to the accompanying diagrammatic drawing, the single figure of which is a sectional illustration of an apparatus for, and a method of, forming a wall plug in situ.

In the drawing, a pressurized container 1 has two separate compartments 3 and 4, which contain respective components 5 and 6 of a two-part plastics composition. Upon activation of a button 7, the two components 5 and 6

are caused to be ejected under pressure through respective portions 8 and 9 of a discharge nozzle 10.

As illustrated in the drawing, the nozzle 10 is placed within a hole 11 formed in a masonry wall 12. Upon emerging from the separated portions 8 and 9 of the nozzle 10, the two components 5 and 6 become mixed together, and immediately foam to form a mousse 13, which fills the hole 11.

Immediately after application, the mousse 13 begins to cure and harden, and within a minute (or within a few minutes), it is sufficiently hard to receive, for example, the threaded shank of a woodscrew. At this stage, the mousse has not set completely hard, but retains a degree of resilience. Thus, as the woodscrew is driven into the hole 11, the hardened but yet resilient mousse 13 deforms to form a firm packing between the screw and the walls of the hole 11, in the manner of a wall plug. Depending upon the choice of plastics components, the mousse 13 may eventually set hard - e.g. after some hours or after 1 to 7 days or more -or may permanently retain a degree of resilience.

Thus, it will be appreciated that the illustrated apparatus is operative to form a wall plug in situ. As the mousse 13 expands to fill the available cavity, it is not necessary for the hole 11 to be formed with any great degree of precision. Indeed, using the illustrated apparatus, a wall plug can be formed in situ, within any irregularly shaped hole or crevice.

Instead of using a two-component composition, the container 1 may have a single compartment containing a single material which is applied through a single nozzle,

but foams upon contact with air. In such a case the container 1 may be pressurized or provided with a suitable inert propellant in order to eject the material from the container.

The outer end of the nozzle 10 is preferably formed of a non-stick and unreactive material, so that any mousse remaining thereon, after application, may readily be removed.

If desired, the nozzle 10 may be partially or substantially fully inserted into the hole 11 during application, so that the mousse 13 is disposed around the nozzle 10, which thus defines a bore within the mousse 13, as it sets. In such an arrangement the outside of the nozzle 10 is desirably formed or coated with a non-stick surface.

The plastics material may be formed from a single component which, on release from the applicator and on contact with the moisture in the surrounding atmosphere and/or masonry, reacts to form a polymeric structure. Components of this type may be based upon di-isocyanates.

Alternatively it may be formed by reacting together and releasing from the applicator at least two components which are held separately within the applicator. Plastics materials which may be formed in this way include those based upon epoxy compounds, di-isocyanates, amino-formaldehyde resins and phenyl-formaldehyde resins, two component polyurethanes, or peroxide cured unsaturated polyester resins.

The component or components may be released from the applicator in the form of for example a spray or a

viscous liquid. On release from the applicator the component or components mix and are allowed to expand within the hole by a foaming action. The foaming may arise from the action of the propellant of the components within the applicator or by the addition of a foaming or blowing agent. Suitable blowing agents include liquids with a low boiling point and low evaporation heat which evaporate on release from the applicator or by the heat produced by the chemical reaction resulting in the formation of the plastics material. Alternatively, the foaming may be produced by compounds which are separated in the applicator but which on release react to produce a gas such as carbon dioxide, hydrogen and/or nitrogen. Such compounds include ammonium carbonate and an acid, metal powders such as aluminium and magnesium and an acid, and benzine sulphonic hydrazide.

The viscosity of the component or components on release from the applicator should be such that the developing gas produced by the blowing agent can be held and further gas bubbles can be formed.

The components may also contain other agents, e.g. surfactants which facilitate the production of homogeneous reproducible foam structures, colouring agents, stabilizers such an anti-oxidants etc.

As an alternative to the container 1, two containers, each containing a component of the plastics material, may be provided. In this case the component held in one container may be injected into the hole 11 prior to the injection thereinto of the second component. The two components may react together in the hole to produce the plastics material. Alternatively, the respective components held in each container may be

injected into a hole at substantially the same time.

The container 1 and other containers described herein, need not necessarily include a propellant provided to eject the material from the containers.

To facilitate correct distribution of the plastics material in a structure typified by hollow or perforated brick, a perforated or mesh sleeve may be first inserted in the hole. The plastics composition is then injected into the sleeve, the foaming action ensuring that it becomes "locked" into the structural member.

The reader's attention is directed to all papers and documents which are filed concurrently with this specification and which are open to public inspection with this specification, and the contents of all such papers and documents are incorporated herein by reference.

All of the features disclosed in this specification (including any accompanying claims, abstract and drawings), and/or all of the steps of any method or process so disclosed, may be combined in any combination, except combinations where at least some of such features and/or steps are mutually exclusive.

Each feature disclosed in this specification (including any accompanying claims, abstract and drawings), may be replaced by alternative features serving the same, equivalent or similar purpose, unless expressly stated otherwise. Thus, unless expressly stated otherwise, each feature disclosed is one example only of a generic series of equivalent or similar

features.

The invention is not restricted to the details of the foregoing embodiment(s). The invention extends to any novel one, or any novel combination, of the features disclosed in this specification (including any accompanying claims, abstract and drawings), or to any novel one, or any novel combination, of the steps of any method or process so disclosed.

CLAIMS:

1. A method for forming a wall plug, comprising the steps of applying a foamed plastics material into a hole, and allowing the foamed plastics material to set to form a wall plug in situ in the hole.

2. A method according to Claim 1, wherein the foamed plastics material is applied through a nozzle which is inserted into the hole.

3. A method according to Claim 1, wherein the foamed plastics material is applied through a nozzle which is directed towards the hole, the foamed plastics material being applied into the hole from the outside thereof.

4. A method according to any of Claims 1 to 3, wherein the foamed plastics material is spray applied.

5. A method according to any of Claims 1 to 3, wherein the foamed plastics material is applied in the form of a viscous liquid.

6. A method according to any of the preceding claims, including the additional step of forming a hole for containing the wall plug.

7. Apparatus for forming a wall plug in situ in a hole, the apparatus comprising a container; a liquid plastics material within the container; means for ejecting the plastics material from the container and nozzle means for applying the ejected plastics material into a hole; the plastics material being such as to foam after application through said nozzle and to cure to a relatively hard state after such application.

8. Apparatus according to Claim 7, wherein the plastics material within the container is a single composition which foams upon contact with air.

9. Apparatus according to Claim 7, wherein the plastics material comprises two or more parts which are held separately within the container and are mixed together before, during or after the application.

10. Apparatus according to Claim 9, wherein said two or more separate parts, upon mixing, react together to produce a gaseous product.

11. Apparatus according to Claim 10, wherein said gaseous product aids curing of the plastics material.

12. Apparatus according to any of Claims 7 to 11, wherein the liquid plastics material is chosen from a group comprising, di-isocyanates, amino-formaldehyde resins, or phenyl-formaldehyde resins.

13. Apparatus according to any of Claims 7 to 11, wherein the liquid plastics material is either an epoxy compound, a two component polyurethane, or a peroxide cured unsaturated polyester resin.

14. Apparatus according to any of Claims 7 to 13, wherein a propellant is included in said container.

15. Apparatus according to any of Claims 7 to 14, wherein a blowing agent is included in said container.

16. Apparatus according to any of Claims 7 to 15, wherein the plastics material is pressurised in order to aid its ejection from the container.

17. Apparatus according to any of Claims 7 to 16, wherein the container includes a surfactant or a colouring agent.

18. Apparatus according to any of Claims 7 to 17, wherein the container includes a compound which stabilises the plastics material.

19. Apparatus according to any of Claims 7 to 18, wherein the nozzle has non-stick properties relative to the plastics material.

20. Apparatus for forming a wall plug, the apparatus being substantially as hereinbefore described with reference to the accompanying drawing.

21. A method according to any of Claims 1 to 6 when carried out by means of an apparatus according to any of Claims 7 to 20.

22. A method of forming a wall plug, the method being substantially as hereinbefore described with reference to the accompanying drawing.

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